

Willimantic Linen Company: Mill No. 1
(American Thread Company: Mill No. 1)
Immediately west of South Main Street,
north bank of Willimantic River
Windham
Windham County
Connecticut

HAER No. CT-44-A

HAER
CONN
8-WIND
1A-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
MID-ATLANTIC REGION, NATIONAL PARK SERVICE
DEPARTMENT OF THE INTERIOR
PHILADELPHIA, PENNSYLVANIA 19106

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HISTORIC AMERICAN ENGINEERING RECORD

WILLIMANTIC LINEN COMPANY: MILL NO. 1
(American Thread Company: Mill No. 1)

HAER No. CT-44-A

Location: Immediately west of South Main Street, north bank of Willimantic River, Borough of Willimantic, Windham, Windham County, Connecticut

USGS Quadrangle: Willimantic, Connecticut
UTM Coordinates: 18.732330.4621110

Date(s) of Construction: 1854; hydropower facilities modified c1900-1903

Present Owner: ATC Partnership
14 Farwell Street
West Haven, CT 06579

Present Occupant: Willimantic Power Corporation
257 East 200 South Suite 800
Salt Lake City, UT 84111

Present Use: Vacant except for powerhouse, in which Willimantic Power Corporation operates new hydroelectric facilities.

Significance: Mill No. 1 was the first large industrial building erected by the Willimantic Linen Company, in a complex which remained the major source of local employment for 130 years. Expansion of facilities c1862-95 by this company, and its successor the American Thread Company, required additional power supply. American Thread Company rebuilt and consolidated two separate water privileges c1900-1903 at Mill No. 1, which is the oldest surviving component at the American Thread complex. The hydroelectric installations made at this time were typical of moderate-sized industrial sites in New England.

Project Information:

The Willimantic Linen Company/American Thread Company complex is eligible for inclusion on the National Register of Historic Places. Willimantic Power Corporation installed new hydroelectric facilities in Mill No. 1, and refurbished or modified some related waterpower delivery system components, in 1988-90. Changes made to the facilities extant in 1988 included: refurbishing the headgates, headrace, and draingate; replacing the trashrack; concrete liner insertion in the penstock; removal of the double-runner horizontal-shaft turbine described below; and deepening of the tailrace. In compliance with Federal Energy Regulatory Commission Article 21 and a request from the Connecticut Historical Commission, Willimantic Power Corporation documented the hydropower facilities extant in 1988 prior to project construction.

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Photographer:

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Summit Hydropower
92 Rocky Hill Road
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Part I: HISTORICAL INFORMATION*

Willimantic Linen Company began operations in 1854 using cotton mills built in 1825, and soon shifted from linen to thread production when the Crimean War interrupted European flax supplies. By 1895, the firm built three new mills, a bleachery and dye house, a storehouse, an office, and other auxiliary structures. American Thread Company purchased Willimantic Linen in 1898 and continued to expand the Willimantic complex until c1915, adding or completing two mill buildings, a second dye house, and a warehouse. Thread manufacture persisted here until 1984. Many of the buildings survive, awaiting proposed redevelopment (Figure 2). This documentation focuses on hydropower development associated with Mill No. 1. For summaries of the history and significance of this complex, see Weaver 1869, Anonymous 1974, Roth *et al.* 1981, and Harlow 1988.

Information on 19th-century Willimantic Linen hydropower facilities is limited, but the overall sequence of development can be inferred from several sources (Gray 1869; Porter 1885; Mueller 1897; Associated Mutual Insurance Company 1908; Sanborn Map Company 1924; Anonymous 1974; personal communications, Laura Knott Twine). Between 1854 and 1864, the company purchased or developed four consecutive water privileges on the Willimantic River, which falls about ninety feet through the Borough of Willimantic over a ledge-dominated two-mile distance (Figure 1). Of the four privileges, totalling some 63 feet of fall, the lowermost had 16.5 feet of fall at a framed timber dam built c1825 in conjunction with a frame cotton mill on the north side of the river. Willimantic Linen bought this site in 1854, along with an 1825 stone cotton mill on the north bank between the two uppermost privileges (the "Spool Shop," at or just above the site of the c1915 warehouse shown on Figure 2). The firm began operations in the older mills, and immediately began construction of Mill No. 1 and related hydropower facilities. It is not clear if the Spool Shop had an associated dam when first built (personal communications, Laura Knott Twine). Willimantic Linen built two dams c1854, above and below the Spool Shop, perhaps replacing or improving an earlier dam in the process. The uppermost dam (the "Spool Dam") was a mortared granite-block structure about 500 feet upriver from Mill No. 1, and developed a water privilege with 13.6 feet of fall (Figure 2). The second 1854 dam, a framed timber structure (later encased in granite block) built at the downstream end of Mill No. 1, provided 11 feet of head (Porter 1885: 26). Willimantic Linen developed its last water privilege c1862-64, building a mortared granite-block dam with 22 feet of fall for Mill No. 2 (Figure 2).

* Capitalized citations refer to photographs included with this documentation.

By the early 1880s, Willimantic Linen had installed turbines in Mill No. 1 generating 270 hp. At this time, turbines in the Spool Shop generated 220 hp. Steampower was used at both sites in times of low water (Porter 1885: 26). The nature and arrangement of these power facilities are poorly documented, but evidently included three wheelhouses: one in the Spool Shop, one at the upstream end of Mill No. 1, and one at the downstream end of Mill No. 1.* A headrace from the Spool Dam conveyed water to undocumented wheels at the first two locations, while water from the second dam entered the lower Mill No. 1 wheelhouse through a arched opening at the north end of the dam (Gray 1869; Mueller 1897; personal communication, Richard Mackowiak; VIEW NORTHEAST OF Wheelhouse AREA, TAILRACE (CENTER), AND DAM...).

American Thread Company consolidated the two upper water privileges to drive hydroelectric facilities centered in the downstream Mill No. 1 wheelhouse c1900-03. In this period, the company completed Mill No. 5 (HAER No. CT-44-B) immediately downstream of Mill No. 1, and deactivated the two upper wheelhouses noted above (later demolishing the Spool Shop). In addition to new Spool Dam headgates, the redesigned power arrangements included a steel penstock running under Mill No. 1 from the end of the Spool Dam headrace, a new 600 hp double-runner horizontal-shaft turbine in the older wheelhouse, and a generator in Mill No. 5 (Figures 3-9; American Thread Company 1900, 1903, 1910-58). Horizontal-shaft turbine installations of this type for electric generation were common c1890-1920 (Hunter 1979: 381-83, 394). The original powerhouse intake, through the arch at the lower of the two dams, was retained for some time to operate a vertical-shaft 75 hp turbine probably used with a non-extant firepump (Figure 9). The combined head of about 24.6 feet from the two uppermost water privileges thus drove a more efficient set of turbines to increase the c1880 horsepower totals by more than a third. By the early 20th century, however, American Thread Company operating demands exceeded its waterpower sources, and steam was the principal source of on-site-generated power at the complex (Associated Mutual Insurance Company 1908). The overall production, purchase, transmission, and use of power here remain undocumented, as do most changes made to the 1900-1903 installations at Mill No. 1. At some point, the original arched intake into the wheelhouse was infilled with mortared rubble and the smaller vertical-shaft turbine deactivated.

* Infilled archways under the upstream end of Mill No. 1 are the only firm available data indicating a turbine room at this location.

Part II: DESCRIPTIVE INFORMATION

This section describes hydroelectric facilities associated with Mill No. 1 as they appeared in 1988, with the exception of the generator in Mill No. 5 described in the brief documentation of HAER No. CT-44-B.

There were five principal components of these facilities: headgates at the Spool Dam; an open headrace running southeast to the northwest end of Mill No. 1, including a section under a c1915 concrete warehouse; a penstock under Mill No. 1; the wheelhouse or powerhouse area at the southeast end of Mill No. 1; and a short tailrace (Figure 3).

Two 5-foot- and two 14-foot-wide, 7-foot-high wooden headgates controlled water intake to the headrace. The metal rack-and-pinion gate operating mechanisms were largely intact (Figures 4-6; VIEW EAST OF HEADGATES AT SPOOL DAM...). A one-story frame gatehouse built over the c1903 mechanisms was gone (Sanborn Map Company 1924). The headrace runs a total of about 475 feet, with a 25-foot width and 10-foot-high mortared granite rubble walls. The open headrace continues about 55 feet southeast of the warehouse as an open canal, with the southern wall penetrated by a 3-foot-wide sluice or drain gate. The headrace terminated in deteriorated metal trashracks at the northwest end of Mill No. 1 (VIEW WEST OF HEADRACE...; VIEW SOUTH OF TRASH RACKS...). Various parts of the uppermost 150 feet of the headrace were covered at different times in the past (Sanborn-Perris Map Company 1892; Mueller 1897; Sanborn Map Company 1924).

Mill No. 1 was built as an approximately 300-foot-long, 3-1/2-story granite ashlar structure, 68 feet wide in most sections, with a central stair tower and a domered gable roof. The 11-foot-diameter riveted steel penstock, supported on mortared granite rubble cradles set between rubble mill foundation piers, runs under most of the mill to the wheelhouse at the mill's southeast end (Figures 3 and 7; VIEW WEST OF PENSTOCK UNDER MILL).

The wheelhouse is an open area over granite ledge, 40 by 33 feet in plan and about 14 to 25 feet high, beneath the first floor of the mill in a flat-roofed section (Figures 8 and 9; VIEW NORTHEAST OF WHEELHOUSE AREA...). Water flowing through the penstock ran a 600 hp, horizontal-shaft turbine with two 36-inch runners, and riveted steel pressure case and draft tube. The shaft between the southern runner and the mid bearing was broken. There is no documentation yet available on the turbine manufacturer or other specifications. The pressure case resembled one in Mill No. 2 (HAER NO. CT-44-C) installed by the Swain Turbine & Manufacturing Company of Lowell, MA, a very prominent turbine-making firm c1860-1900 (VIEW NORTH OF HORIZONTAL TURBINE PRESSURE CASE). The horizontal-shaft turbine drove an approximately 100-foot-long, 6-inch-diameter steel shaft with an 8-foot-diameter flywheel to run the generator in Mill No. 5, and was once connected to a governor (not extant) on the floor above (DETAIL VIEW NORTH OF TURBINE OUTPUT SHAFT...). Supports from the floor beams suspend a wooden walkway through the powerhouse (Figures 6-7).

The wheelhouse also includes a poorly-documented 75 hp vertical shaft turbine in a cast iron case, probably installed in the 19th century and used for a non-extant fire pump in the 20th century. Water impounded by the dam at Mill No. 1 once entered the wheelhouse through a now-closed, 9-foot arch in the southwest wall to drive the older turbine, and presumably all (removed) turbines used in this area during the 19th century (VIEW NORTHEAST OF WHEELHOUSE AREA...). An inoperative horizontal sliding gate once controlled water intake through this arch (personal communication, Richard Mackowiak). All tailwater exited through a 12-foot-high, 24-foot-wide arch in the southeast wall, running through a tailrace about 40 feet long with a 9-foot-high south wall of concrete and mortared granite rubble, and a 15-foot-high north wall of mortared granite rubble (Figures 8-9, VIEW NORTHEAST OF WHEELHOUSE AREA...).

Part III: SOURCES OF INFORMATION

Historic Drawings and Photographs

The Windham Textile and History Museum, which began operations in September 1989, has obtained the surviving drawings of the American Thread Company and about 300 historic photographs. These materials are at present uncatalogued and essentially unavailable; a small number of drawings identified by Summit Hydropower c1984-87 are listed below. For future access to these materials, which will be catalogued over the next several years, contact the museum at 157 Union Street - Main Street, Willimantic, CT 06226, telephone 203/456-2178.

Interviews

Laura Knott Twine, Executive Director, Windham Textile and History Museum, provided information on site history.

Richard G. Mackowiak, Summit Hydropower, provided detailed measurements and descriptions of many hydropower facility components.

Bibliography

American Thread Company

- n.d. [Untitled cross-section of Mill No. 1]. Drawing on file, Windham Textile and History Museum.
- 1900 Plan of #1 Mill and Yard/11 ft. Penstock and Canal. W578. Drawing on file, Windham Textile and History Museum.
- 1903 Detail of New Head Gates/Willimantic Mills. TR 1082. Drawing on file, Windham Textile and History Museum.
- 1910-58 Willimantic Mills. [shows various plans and elevations]. Drawing on file, Windham Textile and History Museum.

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Sanborn Map Company

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Sources Not Yet Investigated

Surviving written records of the Willimantic Linen Company and the American Thread Company are very limited. Plans, drawings, and photographs dating to c1855 will eventually be available at the Windham Textile and History Museum, and may have additional historic waterpower details, some of which could be confirmed with close inspection of building fabric. Comparison of turbine components removed during the 1988-90 hydropower facility reconstruction (many of which were inaccessible when in place) with catalogues of historic turbine-making firms could confirm the origins of the double-runner turbine; see collections at Old Sturbridge Village, Sturbridge, MA, and the National Museum of American Industry, Division of Engineering and Industry, Washington, DC.

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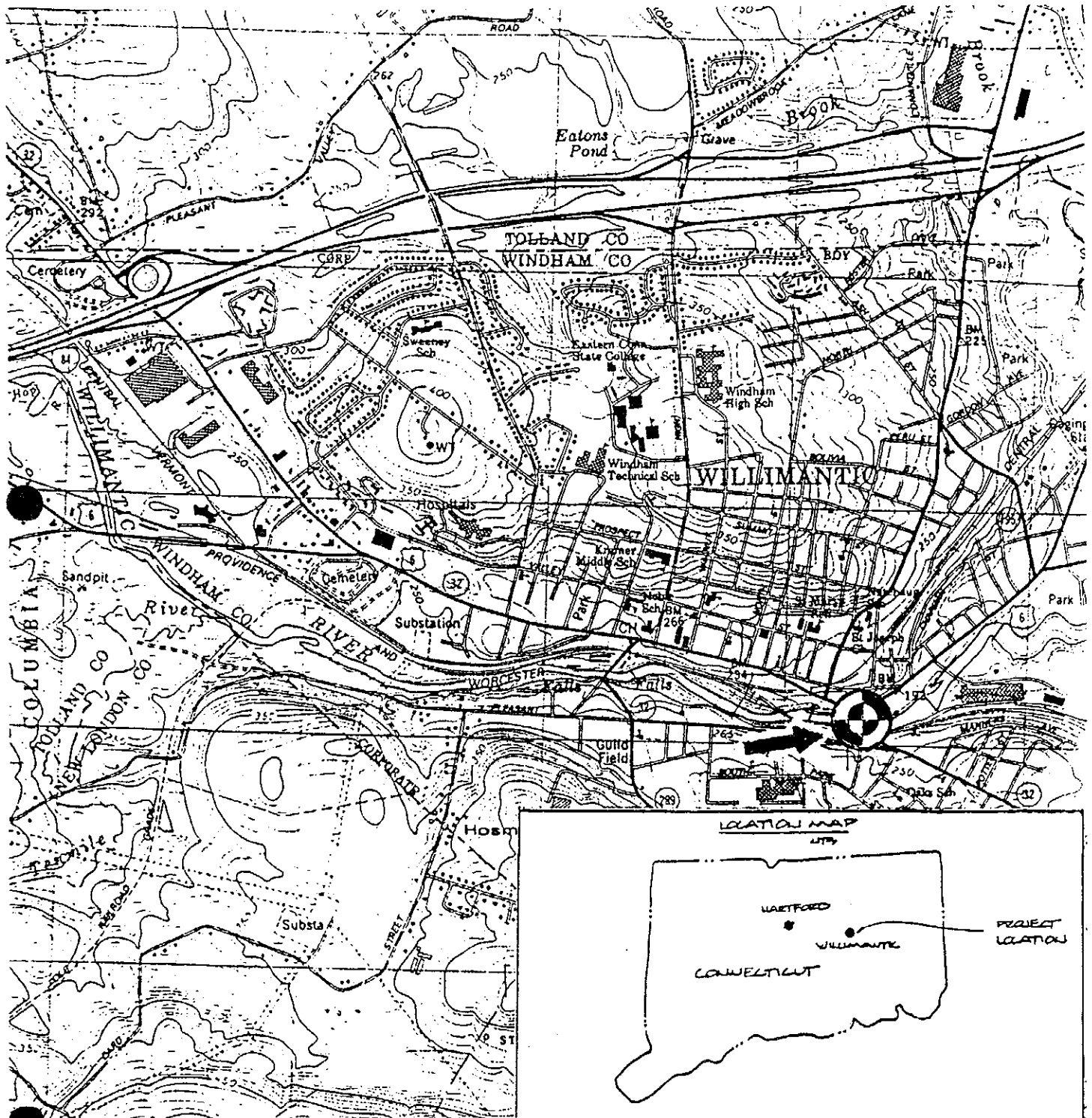


Figure 1. LOCATION OF MILL NO. 1

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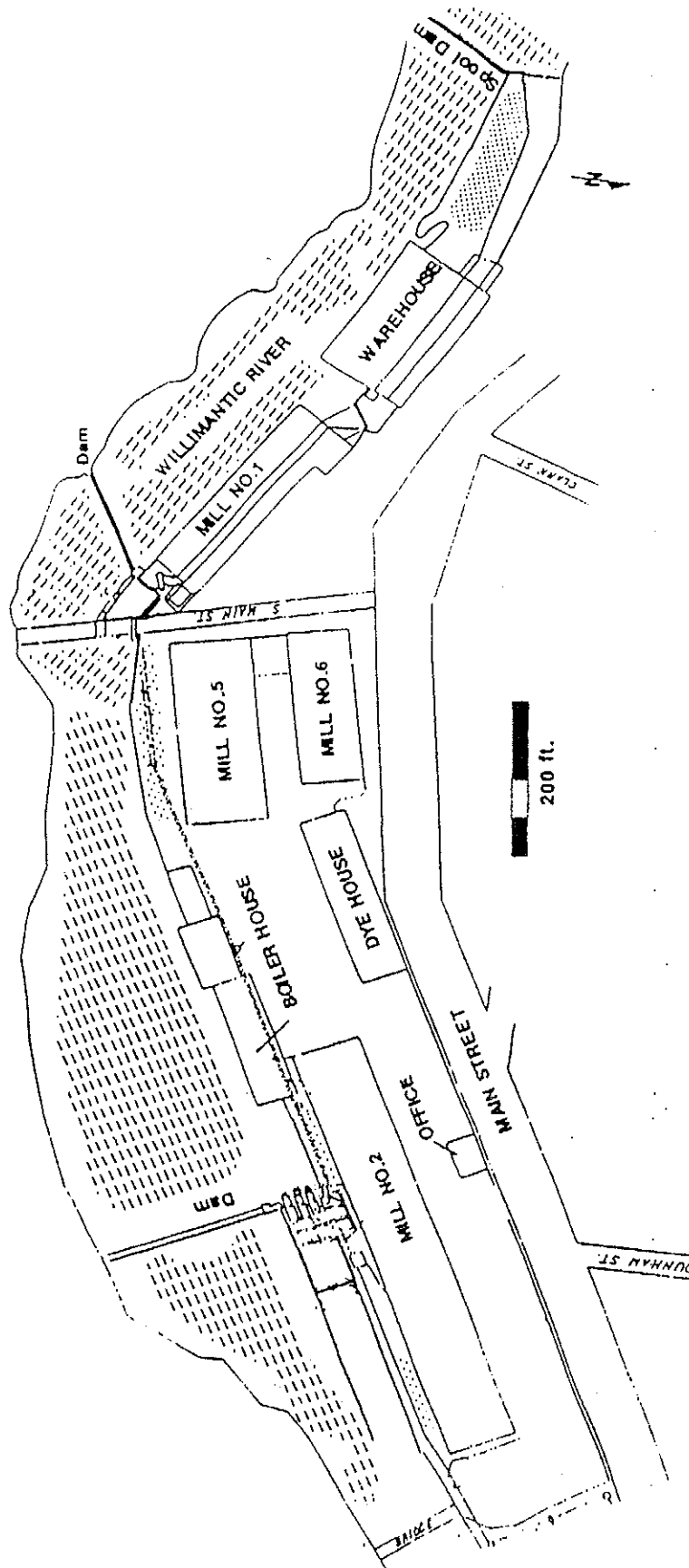


Figure 2. PRINCIPAL SURVIVING COMPONENTS, AMERICAN THREAD COMPANY COMPLEX, WILLIMANTIC, CT

WILLIMANTIC LINEN COMPANY: MILL NO. 1
(American Thread Company: Mill No. 1)
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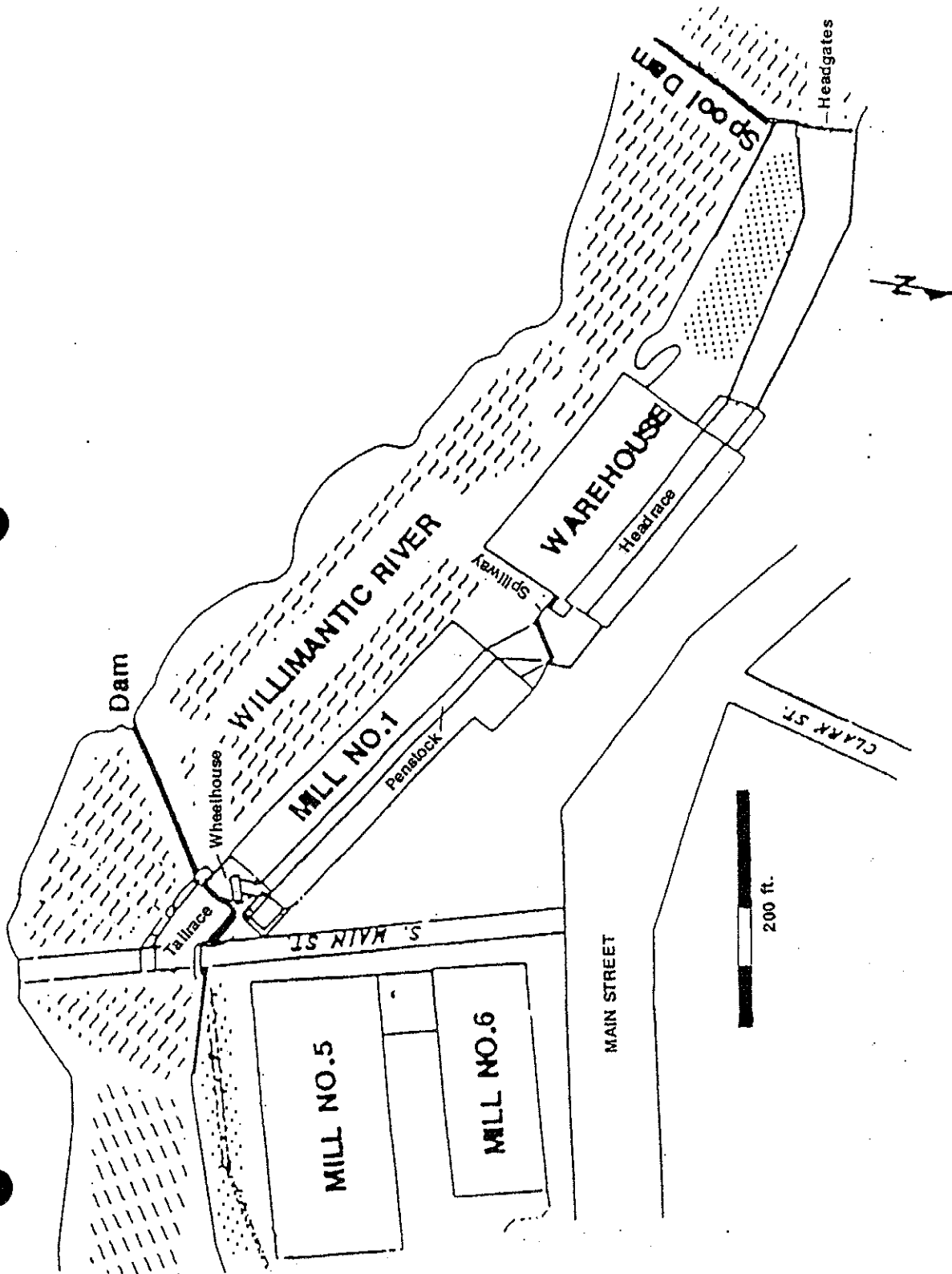


Figure 3. HYDROPOWER FACILITIES ASSOCIATED WITH MILL NO. 1

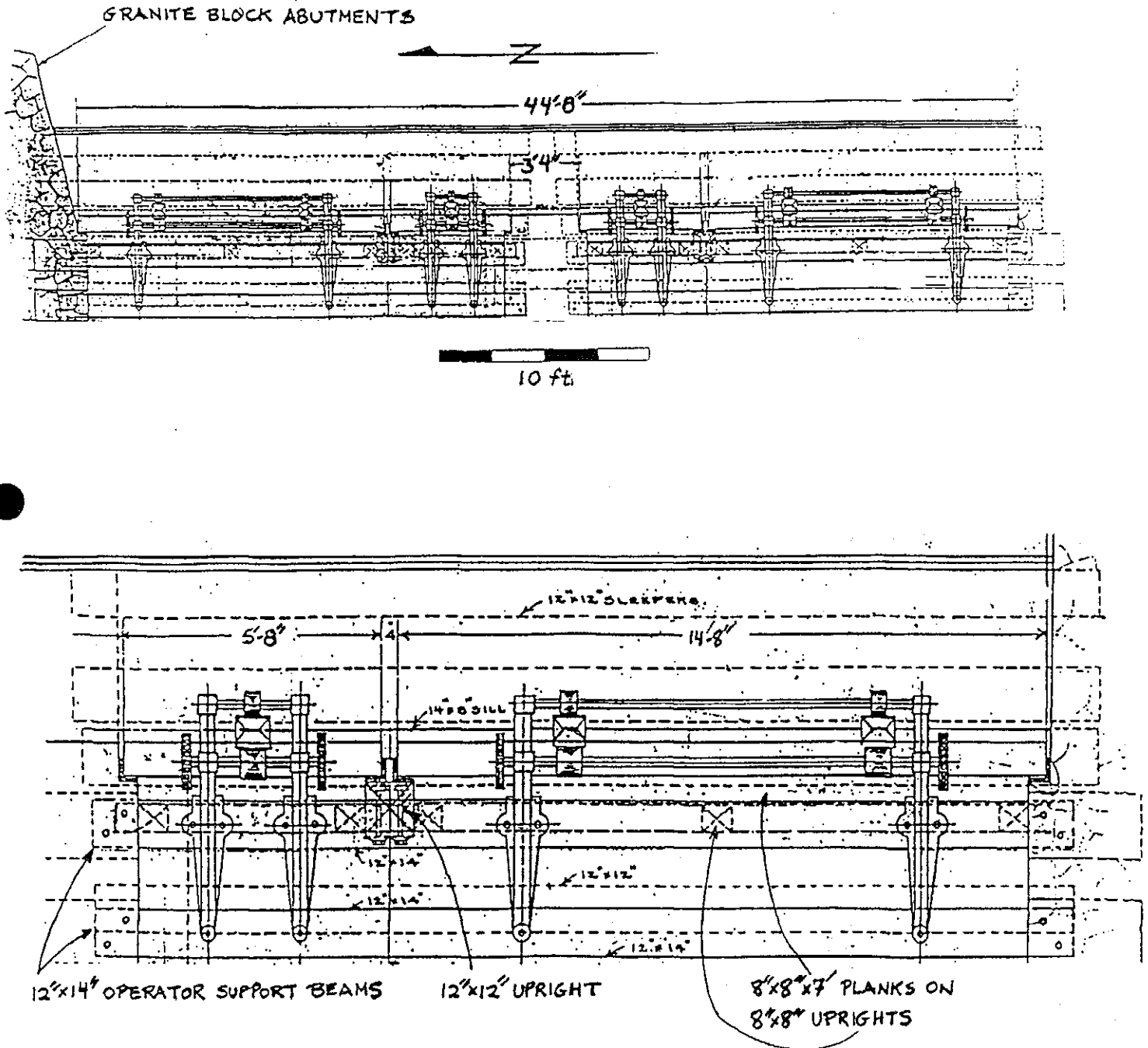


Figure 4. PLAN AND DETAIL (SOUTH HALF) OF SPOOL DAM HEADGATES
 Source: American Thread Company 1903

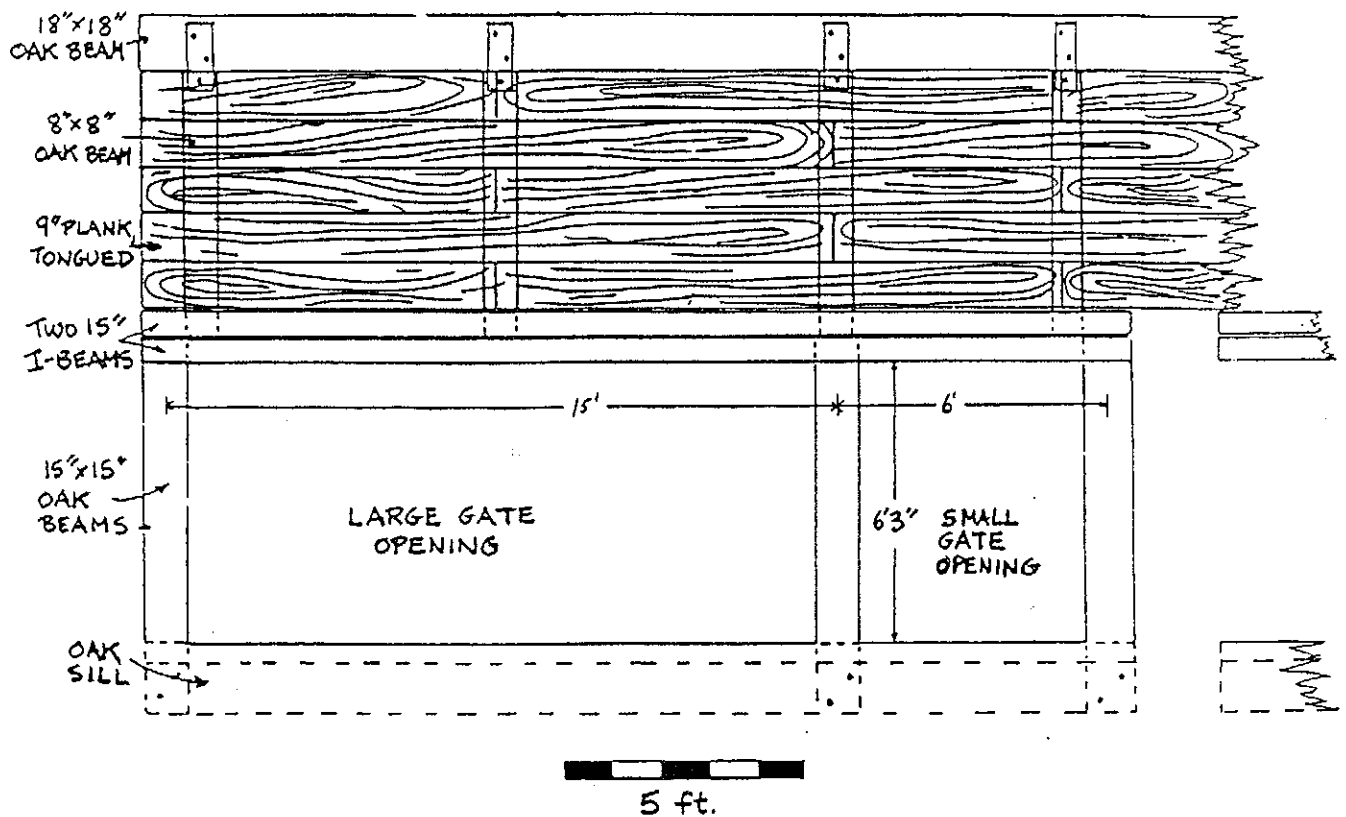


Figure 5. SPOOL DAM HEADGATE ELEVATION DETAILS
Source: Sketch prepared by Summit Hydropower, Woodstock, CT

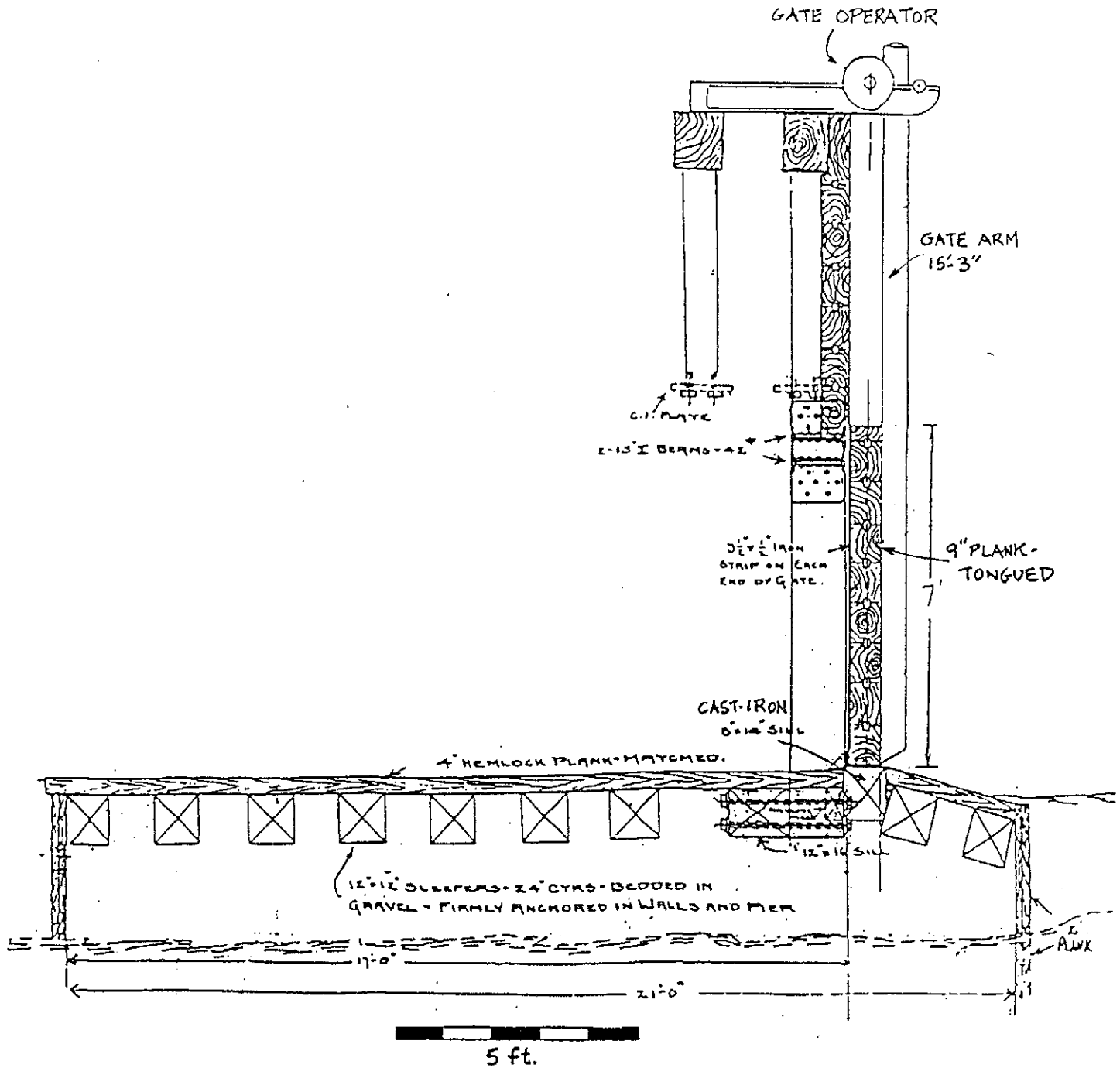
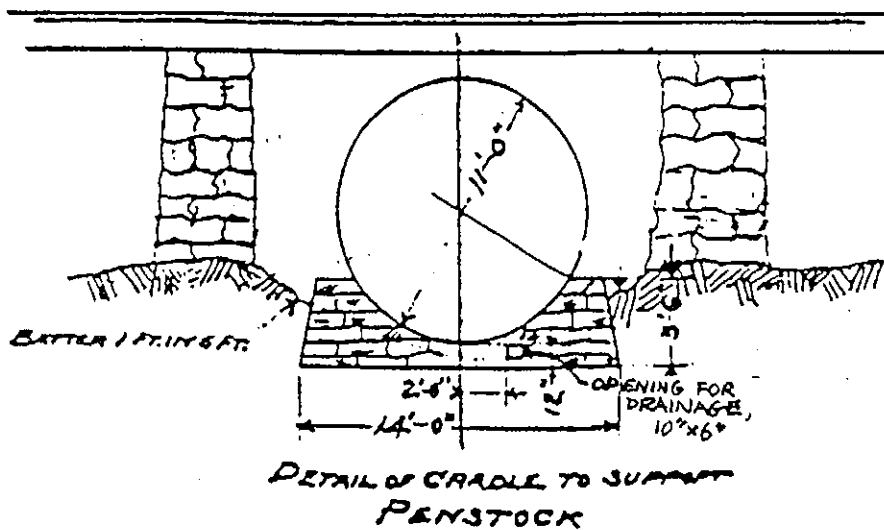
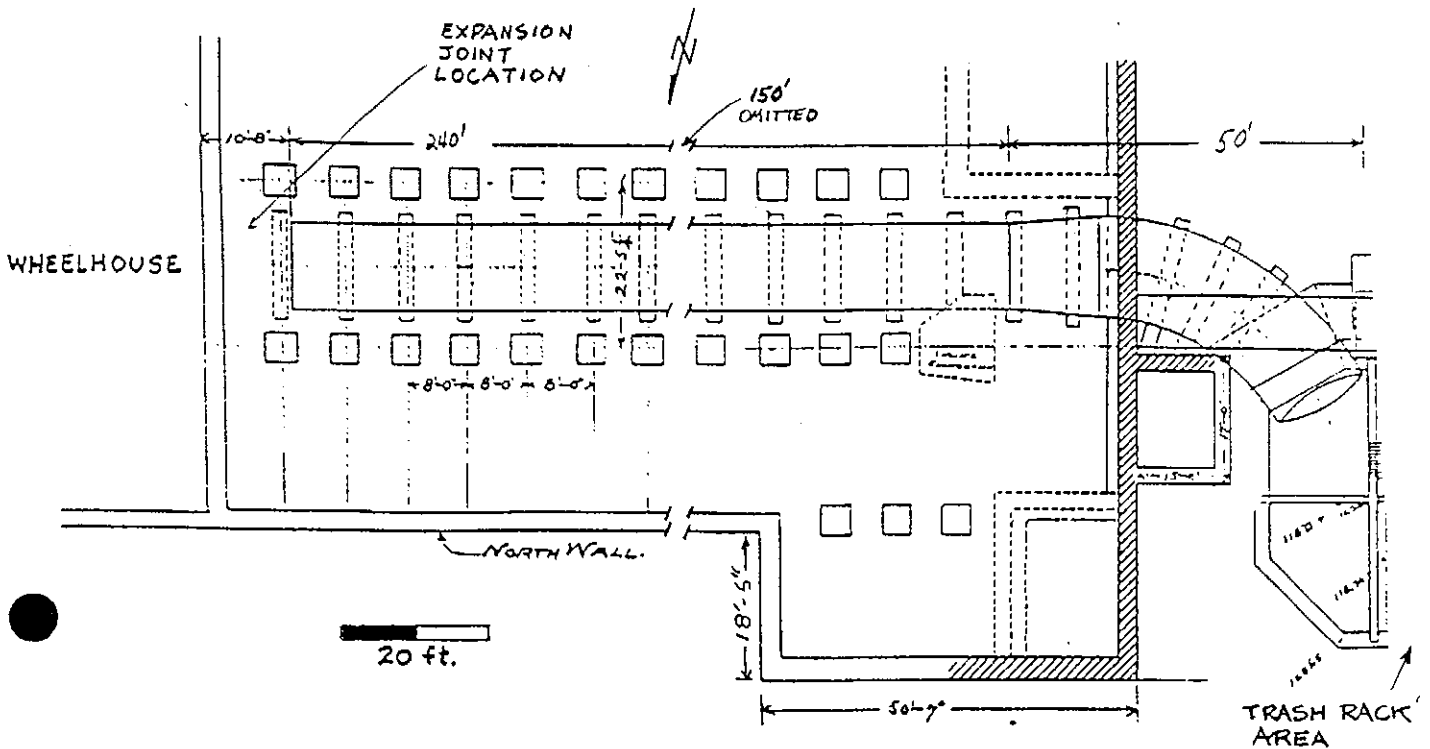


Figure 6. SPOOL DAM HEADGATE SECTION
 Source: American Thread Company 1903

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SECTION AT CENTER OF MILL LOOKING EAST

Figure 7. PLAN AND SECTION OF PENSTOCK UNDER MILL NO. 1
 Source: American Thread Company 1900

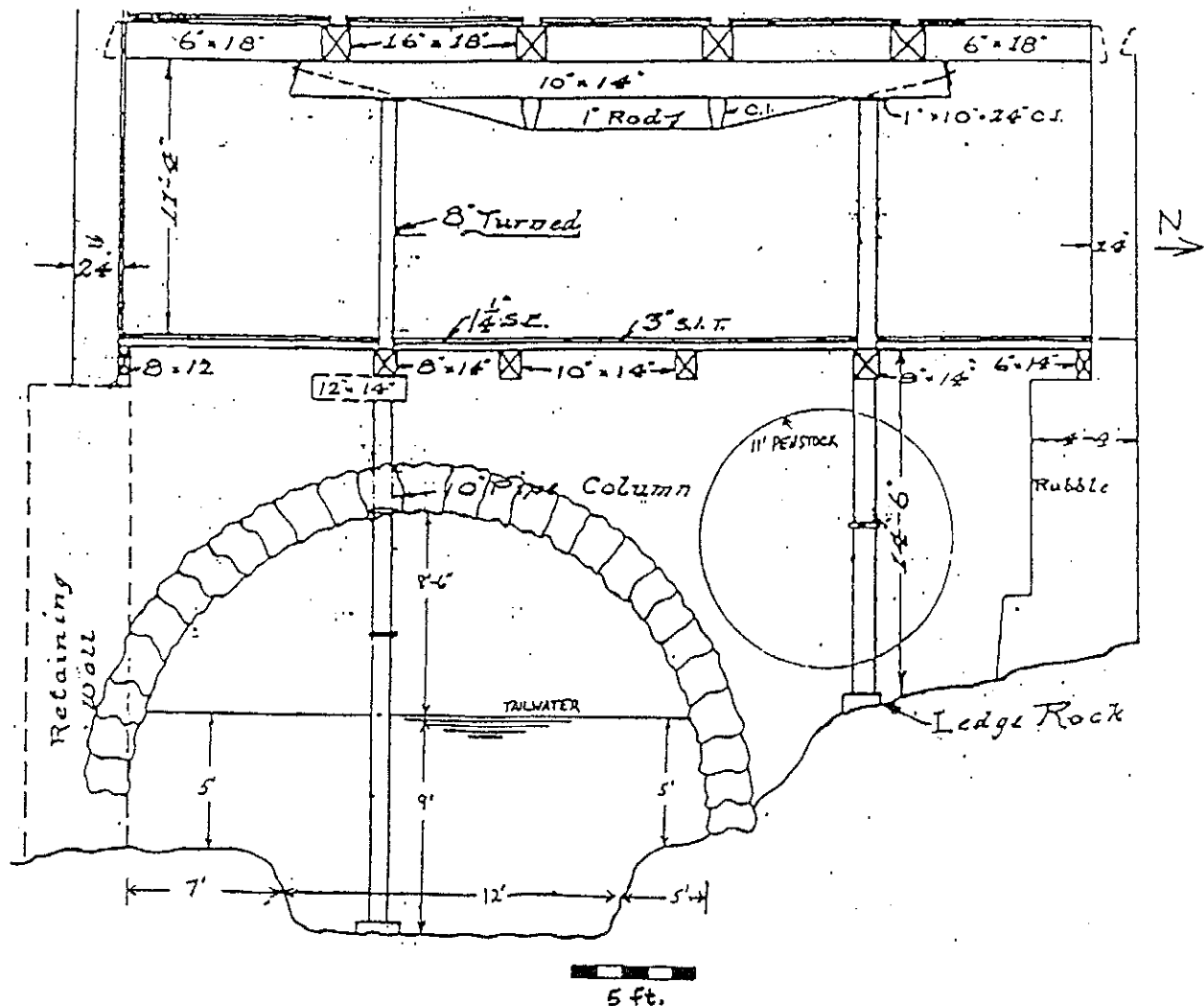


Figure 8. SECTION OF MILL NO. 1 WHEELHOUSE AND FIRST FLOOR
 Source: American Thread Company n.d.

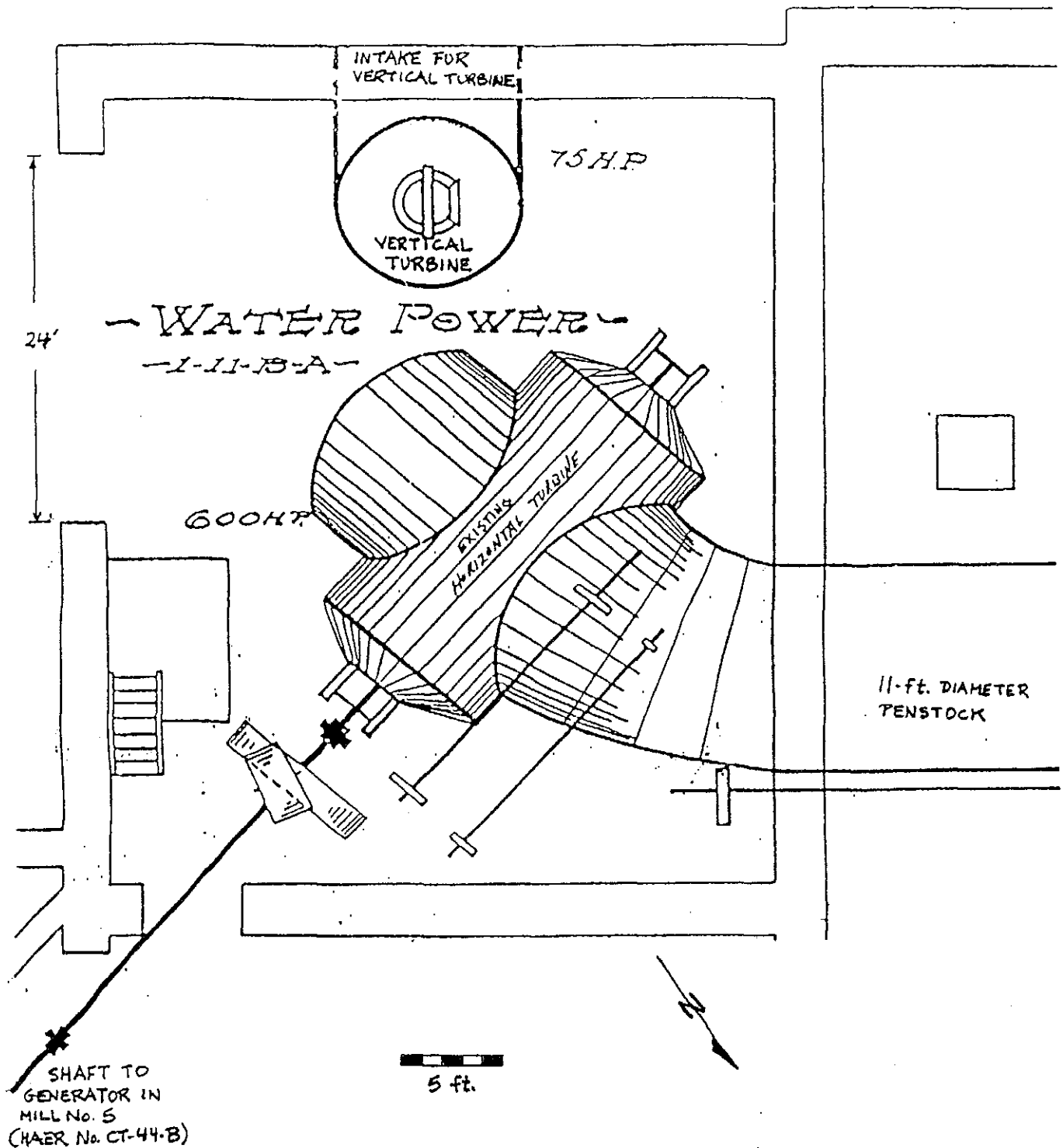


Figure 9. PLAN OF MILL NO. 1 WHEELHOUSE
Source: American Thread Company 1910-58